Solid State Protection System Refresh

Westinghouse

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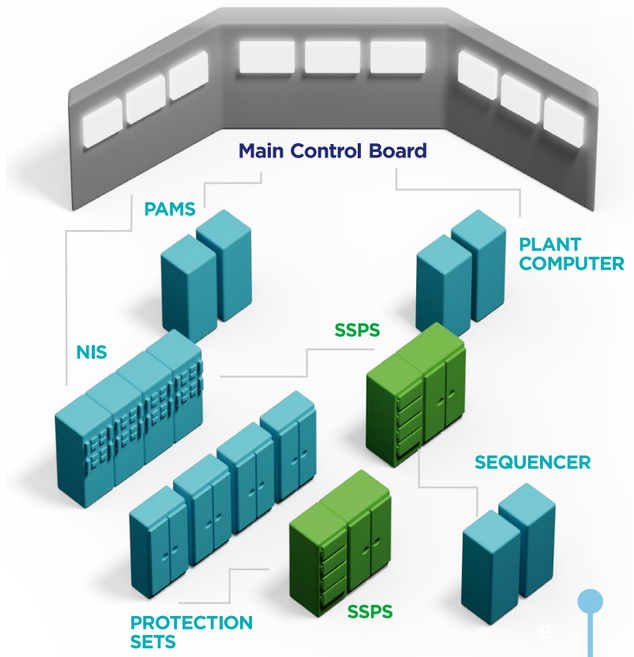
Background

The SSPS has an operational history of more than **five decades** of successful performance. Many SSPS users have reached the point where certain system components require replacement due to wear-and-tear caused by normal usage. Additionally, new versions of SSPS components are available which utilize more modern components which have **improved performance**. An SSPS Refresh is an easily implementable solution for utilities seeking to **extend the service life** of their SSPS.

Standard Westinghouse Gen II Safety System Architecture Scope of SSPS Refresh



Low-Impact System Modernization

The SSPS Refresh rejuvenates the RPS by providing new equipment which can be installed in the **existing locations** and maintains the **existing design** including qualification, diversity, and licensing basis. The SSPS refresh provides **updated technology** such as socketed relays, CPLD-based logic, and enhanced self-diagnostics. The refresh does not impact the overall design and function of the SSPS, it does not require development of new training programs, operational procedures or maintenance practices, and can be installed under **10 CFR 50.59.** The Refresh is the most cost-effective method of modernizing a Westinghouse SSPS.

Benefits

- Installed under 10 CFR 50.59
- Reduces likelihood of spurious trips
- New SSPS printed circuit cards features on-board diagnostics:
- Status LED indications
- Built-in Self-test
- New boards of both trains can be refreshed in a 15-day outage window
- Reduced level of technician support required
- New assemblies mount in the same location as original equipment and maintains seismic and environmental qualification
- Eliminate termi-point connections.
- New components qualified for Electromagnetic compatibility (EMC)
- Operating Experience and Troubleshooting included in WCAP-17677
- Card edge LED display of input and output signals (eliminates need for a meter)

Scope

The SSPS Refresh includes the options listed below. A refresh can include one or more of the scopes listed to be tailored to a specific sites needs.

- CPLD-based Printed Circuit Board Cards
- Replacement Logic-Bay Card Cage
- Replacement Panels
  - Spray Test Panel
  - Logic Test Panel
  - Output Relay Test Panel
- Improved Relay Panels
  - Input Bay
  - Master Relays
- Replacement Secondary Relays
- New Power Supplies
- General Warning Alarm Circuit Modification

Effectively resets the SSPS material aging clock

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Westinghouse is a full-scope nuclear services provider

Value Added Services

The following value added services are also available to SSPS Customers as part of an SSPS Refresh or as standalone offerings:

- **Installation Services**
- **SSPS Support Services**
  - SSPS Card Grooming
  - SSPS Backplane Pin Reforming
  - SSPS Circuit Card Reflashing
- **Licensing Support**
  - 50.59
  - License Amendment Requests

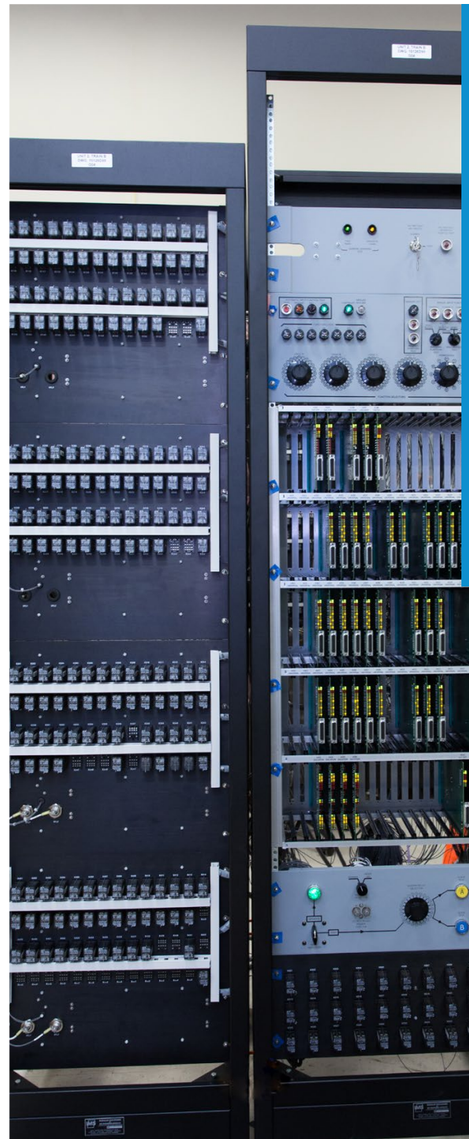
Applicable Codes & Standards

EQ Qualifications

- Environmental – IEEE 323-1983
- Seismic – IEEE 344-1987
- EMC/RFI – RG 1.180, Rev. 1

Industry Standards

- IEEE 603
- IEEE 279



Replacement Printed Circuit Board Cards

The SSPS logic bay is comprised of several Printed Circuit Board (PCB) cards which perform the SSPS functions. The original-design PCB cards have many component-level obselcense and the design has reach end-of-life. Most notably, is that the original cards used devices based on the now defunct Motorola High Threshold Logic (MHTL) technology.

Westinghouse has developed new versions of the SSPS PCB Cards as replacements for the cards originally delivered with the system. These upgraded PCB cards are direct drop-in replacements for the original cards. The replacement PCB cards are built using modern components, which addresses obsolescence and improves reliability and maintainability.

Direct, Drop-In Upgrade for Existing PCB Cards

- **Resolves MHTL Obsolescence issue**
- **Form, Fit, Functional Replacement**
- **Meets or exceeds the electrical specifications of the existing cards**
- **Physically interchangeable and interoperable with existing cards**
- **Installable under 10 CFR 50.59**
- **Reliability Features:**
  - Redundant drivers added to under-voltage driver card
  - Safeguard driver card output circuit improvements
- **Continuous built-in self-testing**
  - New status indications for all inputs and outputs
  - Additional test points

Replacement SSPS Components

New SSPS panels and components are available which are form, fit, functional replacements for the existing components. The new components are manufactured per the original design documents using like-for-like components. The new pre-populated panels install in the existing locations and can be installed under 10 CFR 50.59. The following replacement SSPS components are available:

- **Replacement Logic Bay Card cages and connectors**
- **Spray Test Panel**
- **Logic Test Panel**
- **Output Relay Test Panel**
- **Input and Output Bay Relay Panels**
- **SSPS Power Supplies**

Reduces Plant Trip Risks

General Warning Alarm Circuit Modification

The SSPS General Warning Alarm Circuit Modification (GWACM) is a reliability upgrade designed to **reduce plant trip risk**. The SSPS GWACM was developed with industry cooperation to be compatible with upgraded cards by incorporating the following modifications:

- **New General Warning Monitor Circuit (GWMC)**
  - Replaces existing GWMC.
  - Recovers voltage margin within the reactor breaker under-voltage coil trip circuit.
  - Reduces likelihood of spurious trip due to power supply fluctuations
- **Non-Urgent Alarm modification**
  - Removes “non-urgent” signals from logic for General Warning Alarm
  - Addition of new non-urgent alarm.
  - Reduces likelihood of SSPS partial-trip condition

These modifications can be installed under 10CFR50.59, and therefore do not require prior approval from the USNRC. Additionally, Westinghouse can provide the necessary inputs to support follow-up licensee-required activities.

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Check out our inventory and contact a Westinghouse Parts representative at

https://marketplace.parts.westinghousenuclear.com/